

ATTY DOCKET NO.  
13DV-12142DOC. ID  
DV12142A

3

get peened surface to a depth in a range of about 20-50 mils into  
15 said region.

sub C 8 16. (AMENDED) A gas turbine engine compressor blade  
comprising:

a metallic airfoil having pressure side, a suction side,  
a leading edge, and a trailing edge,

5 a first laser shock peened surface extending radially at  
least along a portion of one of said edges on a side of said  
airfoil extending radially along and chordwise from said one  
of said edges,

get a second laser shock peened surface extending radially  
10 at least along a portion of the other one of said edges on a  
side of said airfoil extending radially along and chordwise  
from said other one of said edges, and

regions having deep compressive residual stresses  
imparted by laser shock peening (LSP) extending into said  
15 airfoil from said laser shock peened surfaces along said  
leading and trailing edges of said airfoil wherein said deep  
compressive residual stresses extend from said laser shocked  
peened surfaces to a depth in a range of about 20-50 mils into  
said regions.

#### REMARKS

The Office Action mailed January 18, 1996 has been  
carefully considered and the amendments above and the  
following remarks are respectfully submitted in response to  
the Examiner's Rejection of Claims 1-20 and subsequently  
discovered inadvertent typographical and other errors found in  
the specification.

#### Double Patenting

1. The Applicants acknowledge the Examiner's obvious  
type Double Patenting rejection of Claims 1, 6, 11 and 16 with  
regards to Claim 1 of U.S. Application No. 08/399287, and  
appropriate action will be taken by the Applicants upon  
completion of prosecution of the present Application.

Claim Rejection - 35 USC §103

2. The Examiner's second rejection of Claims 1-8, 11-13 and 16-18 under 35 U.S.C. §103, as being unpatentable over Neal et al. (Neal) in view of the American Machinist article (Am. Mach.), has been carefully considered by the Applicants and the claims have been amended to more particularly point out and distinctly claim the subject matter, which the Applicants regard as the invention. The newly added limitation more clearly defines and points out the nature of the "compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said laser shock peened surface to a depth in a range of about 20-50 mils into the laser shock peened regions" to show that they are deep stresses and far stronger forces are used than taught by Neal, and which in effect Neal teaches away from.

This is far stronger than anything indicated or anticipated by the Neal patent which indicates a far force is to be used and a weaker stress distribution which only extends down to about 7 mils. Neal states in column 3, lines 5-8 that a peening intensity of .25 to .30 N, as measured by Almen strips, is to be used which produces compressive residual stresses down to a depth of between .13 and .18 mm as stated in column 6, lines 23-29, which according to our calculations is about 7 mils. The stress distribution imparted by laser shot peening of the present invention, and now more specifically claimed, extends down to about 20-50 mils into the laser shock peened regions which is far greater than that called for in Neal, and requires a force far in excess of what Neal teaches away from and actually warns against.

The Applicants respectfully submit that the Examiner's combination of prior art and subsequent rejection have been overcome by the amendments and remarks above and that the present claims are patentable over the combination of cited references because of the differences between the prior art and the claims at issue. The prior art itself not only fails to teach a particular combination which results in the claimed invention, but in fact, teaches away from and warns against

the present invention and is inconsistent with the purposes of the present invention.

Furthermore, the Applicants respectfully suggest the Examiner broke the invention into its constituent elements, found each element of the invention in the prior art, and then claimed it would have been obvious for one of ordinary skill in the art to reassemble those elements into the invention; all of which constitutes the forbidden hindsight reconstruction in analyzing obviousness. In re Mahurkar, Double Lumen Hemodialysis Catheter Patent Litigation, 831 F. Supp. 1354, 1374-75, 28 U.S.P.Q.2d 1801 (N.D. Ill. 1993).

The Am. Mach. article makes no reference to treating fan blade edges and Neal desires the impact of the shot, due to gravity shot peening, to be at a maximum oblique angle to the tangent of the edge surface which is designed to lessen the peening force to avoid deformation, which directly contradicts both the Am. Mach. reference and the teaching of the present invention. The present invention uses much greater stress level to far greater depths than the Neal patent which the Neal patent teaches away from and seeks to avoid. The obliqueness of the shot hits in Neal lowers the impact energy and residual compressive stress levels and, thus, would teach a person skilled in the art to stay away from the force of laser shock peening of the present invention and that of the Am. Mach. reference.

The present invention provides laser beam shock induced deep compressive residual stresses extending into the airfoil from the laser shock peened surface to a depth in a range of about 20-50 mils into the laser shock peened regions. There is no indication this what is shown in the Neal reference and, in fact, it would appear that Neal is teaching away from these levels and, therefore, away from laser shock peening edges of blade airfoils. In column 5, line 19 Neal clearly shows that he is using the obliqueness on edge impacts to limit and maintain far lower levels of compressive residual stresses than that found in the present invention and in the Am. Mach. reference and which is directly contrary to the present

invention and the Am. Mach. reference both in product, process and purpose.

The Examiner has also not shown that the prior art references have the same purposes as each other or as the present invention. References may be combined to establish the obviousness of a claimed invention if some objective teaching exists in the prior art or if knowledge is generally available to one of ordinary skill in the pertinent art that would lead one to combine the relevant teachings of the references, *In re Fritch*, 972 F.2d 1260, 1265, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992). The Applicants respectfully submit that the Examiner has not shown the basic elements of the claims to be in the prior art or that such knowledge is generally available to one of ordinary skill in the pertinent art. Additionally, the court in *Fritch* states that the prior art may not be modified absent some teaching or suggestion in the prior art supporting the modification. The mere fact that the prior art may be modified to make it more like the claimed invention does not render the invention obvious unless the prior art suggested the desirability of such a modification. The Examiner has used impermissible hindsight to combine references and attributed it to knowledge of one of ordinary skill in the art without any proof or any showing in the prior art that such is the case.

Therefore, the Applicants respectfully submit that the Examiner's rejection of amended Claims 1-8, 11-13 and 16-18 under 35 U.S.C. 103, has been overcome by the amendments and remarks, because of the absence of features of the presently claimed invention, because there has been nothing, not even a suggestion, shown in the prior art as to why the references should be combined as done by the Examiner, and because it appears that the Neal reference teaches away from both the present invention and the Am. Mach. reference.

3. The Examiner's second rejection of Claims 9, 14, 15, 19 and 20 under 35 U.S.C. §103, as being unpatentable over Neal et al. (Neal) in view of the American Machinist article

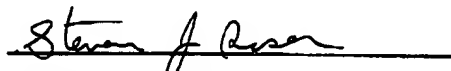
ATTY DOCKET NO.  
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7

(Am. Mach.), and further in view of the Japanese Patent 64201 has been carefully considered by the Applicants and the claims have been amended to more particularly point out and distinctly claim the subject matter, which the Applicants regard as the invention, as pointed out above with regards to the combination of Neal and the American Machinist article. The newly added limitation more clearly defines and points out the nature of the "compressive residual stresses imparted by laser shock peening (LSP) extending into said airfoil from said laser shock peened surface to a depth in a range of about 20-50 mils into the laser shock peened regions" to show that they are deep stresses and far stronger forces are used than taught by Neal, and which in effect Neal teaches away from. Therefore, the Applicants respectfully submit that the Examiner's rejection of amended Claims 9, 14, 15, 19, and 20 under 35 U.S.C. 103, has been overcome by the amendments and remarks because of the absence of features of the presently claimed invention, because there has been nothing, not even a suggestion, shown in the prior art as to why the references should be combined as done by the Examiner, and because it appears that the Neal reference teaches away from both the present invention and the Am. Mach. reference.

4. The Applicants respectfully submit that Claims 1-20 are now in condition for allowance based on the amendments and remarks above.

Respectfully submitted,



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